

Biomaterials in Asia

In Commemoration of the 1st Asian Biomaterials Congress

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In Commemoration of the 1st Asian Biomaterials Congress

Tsukuba, Japan 6 – 8 December 2007

edited by

Tetsuya Tateishi

National Institute for Materials Science, Japan



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PREFACE

History of the Asian Biomaterials Congress

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The 1st Far-Eastern Symposium on Biomedical Materials was held October 5-8, 1993, at the Beijing Friendship Hotel in China. The scale of the event included 11 invited lectures, 58 general topics, and 38 poster presentations. This first monumental international conference on biomaterials in Asia was made possible by the efforts of two preeminent figures in the field, then-Prof. Ikada of Kyoto University in Japan and Prof. Zhang of Sichuan University in China. The setting was equally impressive, with the leaves of the Chinese parasol tree visible throughout Beijing, trembling soundlessly in the laminar flow wind characteristic of the Chinese continent, which was blowing gently through the slightly cloudy mid-autumn Beijing sky. Although this symposium was renamed the Asian Symposium on Biomedical Materials (ASBM) starting with the fourth meeting, a total of seven meetings were held up to 2006. As data on the symposium, Table 1 shows the transition in the number of presentation topics from the 1st Far-Eastern Symposium to the 7th ASBM. This table was based on materials provided by Prof. Tabata of Kyoto University, who served as Secretary-General of the symposium during this period.

Around 1990, the amount of research on biomaterials grew rapidly in Japan as a result of the great efforts of our predecessors. This was a period when

Table 1. History of ASBM.

Conference Name	Venue	Chairman	Number of Invited Lectures	Number of Oral Presentations	Number of Poster Presentations
ASBM 1	Beijing (1993)	Zhang	11	58	38
ASBM 2	Kyoto (1995)	Ikada	12	68	36
ASBM 3	Chengdu (1997)	Zhang	11	99	47
ASBM 4	Singapore (1999)	Zhang & Ikada	14	73	20
ASBM 5	Hong Kong (2001)	Leng	28	101	39
ASBM 6	Chengdu (2004)	Zhang	24	127	110
ASBM 7	Cheju (2006)	Kim	39	68	137

biomaterials research left behind the conventional paradigm, in which a smattering of bioscience was incorporated in existing fields of materials research. At the same time, universities began to produce professional researchers who committed their research lives to the full-scale study of biomaterials from the start, and the biomaterials R&D population increased substantially. In fact, progress on the road to comprehensive biomaterials research began to accelerate, as evidenced by the expansion and reorganization of Kyoto University's Medical Macromolecular Research Center, which existed from 1980 to 1990, as the Biomedical Engineering Research Center. Prof. Ikada, who was the Director of the Biomedical Engineering Research Center at the time, in cooperation with Prof. Zhang, Director of the Biomaterials Engineering Center at Sichuan University, which was a representative presence in biomaterials research in China, planned the 1st Symposium on Biomedical Materials in order to secure a venue for research presentations, exchanges of information, and exchanges of researchers in East Asia. Given the general conditions in Asia, the time was ripe for holding this kind of symposium.

An interesting story concerning the inception of another Asian biomaterials symposium was provided by Prof. Yui of the Japan Advanced Institute of Science and Technology (JAIST). When Prof. Yui was planning the introduction of JAIST, which was to be established shortly, Prof. Akaike of the Tokyo Institute of Technology recommended holding an international

symposium. This provided the first impetus toward the creation of a new symposium. Prof. Yui then consulted with Prof. Okano of Tokyo Women's Medical University, which led to concrete discussions about launching a regular international symposium, centered on Asia, to provide a forum for disseminating the results of research on biomaterials. Because Prof. Tsuruta had just joined JAIST as a Visiting Professor, this distinguished scientist was asked for guidance on various matters. As a result, the 1st Asian International Symposium on Biomaterials (AISB) was held at JAIST in 1997 (fifth year of Prof. Yui's appointment at JAIST). At this time, researchers in the field of macromolecular biomaterials from Japan, Korea, and Taiwan were invited and the basic policy for holding future international symposiums was determined. This symposium was originally planned as a biennial event. However, because the year 2000 was also the 60th birthday of Prof. S. W. Kim of the University of Utah, the second meeting was held in 2000 rather than in 1999. Prof. Yui served as Secretary-General until the third meeting and, until then, the symposiums centered on Japan, Korea, and Taiwan. At each of the first three meetings, both proceedings and a commemorative book were issued.

Japan was again the host country for the 4th Symposium, and Prof. Akashi, who was at Kagoshima University at the time, was to be in charge. However, just at that time, it was decided that he would move from Kagoshima University to Osaka University, and Prof. Tanaka, who was Managing Director of the Biomaterials Center at NIMS (presently professor at Tokyo Institute of Technology) was hastily placed in charge. Because this symposium was intended from the outset to be a public event of the Japan Society for Biomaterials, the fourth meeting was held under the sponsorship of that organization and, as a result, the scope was expanded to encompass not only macromolecular materials, but also fields related to metals and inorganic materials. Table 2 shows the transition in the number of presentation topics from the 1st AISB to the 5th AISB, based on data provided by Prof. Yui.

From the 1st to the 4th meeting, the planning focused on invited lectures, and a large number of general topics were adopted for the first time at the fifth meeting.

Until the 1990s, orthodox biomaterials research centering on macromolecular materials, ceramics, metals, and other composites and surface treatment techniques for improving biocompatibility represented the main direction in biomaterials. However, since around 2000, the application of biologically-derived substances and hybrid techniques incorporating cellular materials have become conspicuous. As a result of the rapid progress of research

and development in cell scaffold materials as a basic technology supporting regenerative medicine, this trend has played a role in pushing tissue engineering and regenerative medicine into the spotlight in medical engineering.

Actually, the fact that the number of topics began to increase rapidly at both of these two Asian biomaterials symposiums during this period truly tells the story of the conditions at that time. In addition, in 1998, the Biomedical Engineering Research Center at Kyoto University was reorganized as the Regenerative Medical Science Research Institute.

On a personal note, on April 1, 2000, I transferred from a laboratory at the Agency of Industrial Science and Technology (former AIST), where I had worked for many years, to a professorship in the Department of Mechanical Engineering, School of Engineering, at The University of Tokyo, where I started a laboratory in bioengineering for regenerative medicine. The following year, on April 1, 2001, I became the concurrent managing director of the Tissue

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Engineering Research Center at the National Institute of Advanced Industrial Science and Technology (new AIST; reorganized as an Independent Administrative Institution from the aforementioned Agency of Industrial Science and Technology). Thus, I also have many fond memories of efforts to keep up with the rapidly changing trends of the times.

Recent research on biomaterials also includes nanobiotechnology, drug delivery systems (DDS), genetic engineering, molecular biology, and other

fields, in addition to bioengineering for regenerative medicine. This feels like a whole new world from the 1970s, when my own involvement in biomaterials began. In recent years, at both the ASBM and the AISB, the expansion in the range of presentation fields and the increase in the number of topics have been remarkable, reflecting this diversity. As a natural development, many persons have expressed hopes for the realization of an organization such as the Asian International Union of Societies for Biomaterials Science and Engineering, which attempts to create an organization of groups of specialists which can cope with this kind of diversification of research fields and overcome national and regional barriers. The same opinion has also been heard from influential persons in leadership positions in the biomaterials societies of the various Asian nations, and the Japanese Society for Biomaterials understands that negotiations have already begun, centering on directors with responsibilities for international matters.

As described in this history, at least two general symposiums on biomaterials currently exist in Asia, and many researchers and scientists have continued to attend and present research topics at both. Given this situation, motions were made at the ASBM-7 steering committee meeting on Jeju Island and the AISB-5 steering meeting on Xiàmén in 2006 to hold the next round of symposiums in 2007 jointly, and the agreement of prominent persons leading

Table 3. Number of papers submitted for 1st ABMC.

Plenary Lectures		4	
Oral Presentations	Metal	16	129
	Ceramics	14	
	Biomechanics	6	
	Polymer-Tissue Regeneration	52	
	Nano-bio	21	
	DDS	10	
	Evaluation & Standard	10	
Poster Presentations	Metal	23	261
	Ceramics	26	
	Biomechanics	7	
	Tissue Regeneration	69	
	Polymer	35	
	Nano-bio	45	
	DDS	46	
	Evaluation & Standard	10	
TOTAL		394	

these two symposiums was obtained. As a result, the 1st Asian Biomaterials Congress (ABMC) was held in Tsukuba City, Ibaraki Pref., Japan (see Fig. 1). This Asian Biomaterials Congress was scheduled for December 6-8, 2007, at the Epochal Tsukuba International Congress Center, with a post-congress seminar and tours of laboratory facilities on December 8.



Figure 1. Location of Tsukuba City in Japan.

The Tsukuba area is about 60 km from Tokyo. It was originally a rural farming district. In 1963, it was chosen by the Japanese Government as the site of a new city that was to be devoted to academic research. You can see the results of that decision here today. During the period of more than 30 years since Tsukuba Science City was constructed, Tsukuba has come to play the role of a showplace for Japanese science and technology. From the viewpoint that Tsukuba was constructed as a large-scale science city led by the relocation of national research institutes and universities, mostly from Tokyo and the surrounding area, it can also be said this was Japan's first "experimental city." Originally, 45 national research institutes, 4 universities, and more than 200 private company laboratories formed the nucleus of the city; its population now exceeds 220,000. In the past, however, transportation was inconvenient, making Tsukuba seem like an island isolated from the mainland, and it was necessary to overcome this serious handicap when hosting international conferences. In August 2005, a high-speed rail line called the Tsukuba Express began service, reducing travel time from Akihabara in Tokyo to Tsukuba to only 45 minutes. As a result, Tsukuba is an increasingly popular spot in the northern Kanto area,

and its population is also increasing rapidly. Because the Epochal Tsukuba International Congress Center is less than a 10-minute walk from Tsukuba Station, which is the terminus of the Tsukuba Express, and is part of a complex that includes the Hotel Okura, this is a very suitable venue for the 1st Asian Biomaterials Congress. While the attendance at the first convention in 1993 did not exceed 110, for this present meeting we received about 400 applications from individuals in 15 countries desiring to attend this congress (Table 3).

It has given us great pleasure to welcome the many participants, and I feel that we have had a series of extremely interesting and significant discussions. I hope that the exchange we had here will provide the basis for the development of new ideas and principles in the field of biomaterials and stimulate active future collaboration, while at the same time contributing to international friendship and understanding.

In order to realize the immense potential of biomaterials and tissue engineering, an intensive international effort will be required to provide the basic structure-function relationships from the molecular to the tissue level and to develop the engineering systems analysis needed to produce functional tissue replacements including key technologies, such as biomolecular factors, cells, biomaterials, engineering design, bioinformatics, and cell-based technologies.

I think the Congress will be held every other year but, in any case, what's important is to create an association of the biomaterials societies in all countries. This will be a topic at the upcoming Congress, and I expect that we might see the birth of an Association of Asian Biomaterials Societies. If we can set the stage for this, holding this Congress will be a significant event indeed.

At present, the executive committee for the international congress, an advisory committee, international committee, and domestic committee for the Asian Biomaterials Congress have been organized. Relative to the subject matter of the congress, the objective was to hold a congress with a strong all-Asia flavor by adopting the widest possible range of biomaterials and related fields throughout Asia. The advice and cooperation of all those concerned is still sought.

In closing, I would like to express my sincere appreciation to Prof. Zhang, Prof. Ikada, Prof. Okano and other representatives from each of their respective countries for contributing so much to make the Congress successful.

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The First Asian Biomaterials Congress

Tsukuba, Japan

December 6-8, 2007

CHAIRMEN

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USHIDA, Takashi, Japan

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IKADA, Yoshito, Japan

OKANO, Teruo, Japan

ZHANG, Xingdong, China

XI, Tingfei, China

LENG, Yang, Hong Kong, China

KIM, Young Ha, Korea

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TEOH, Swee-Hin, Singapore

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